



Annual *Medicago*—from model crop to model plant in disease resistance research (Invited Review)

Host resistance promises cost-effective, long-term control of many foliar and soil-borne pathogens. **Tivoli *et al.*** (pp. 1117–1128) discuss the emergence of *Medicago truncatula* as a more useful and agronomically relevant alternative to *Arabidopsis thaliana* as a model plant for understanding the mechanisms of resistance to necrotrophic pathogens of legumes.



Thermogenesis in *Victoria amazonica*

Thermogenic flowers of this Amazon water lily maintain warm floral chambers, where scarab beetles eat and mate (**Seymour and Matthews**, pp. 1129–1135). This heating not only enhances attractive floral scent, but also continues through beetle residence and appears to be an energy reward. The beetles are also thermogenic and the warm environment saves energy they would otherwise expend to warm themselves.



Warm stratification overcomes dormancy in *Acanthocarpus preissii*

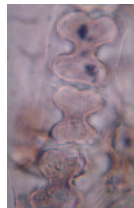
Many Australian species are difficult to germinate due to poorly understood

dormancy mechanisms. **Turner *et al.*** (pp. 1137–1144) show high germination by *A. preissii* seeds after warm stratification and identify the time of year when warm stratification occurs naturally in the south-west of Western Australia.



Antifungal properties of haem peroxidase

Ghosh (pp. 1145–1153) find haem peroxidase is localized in leaf epidermis and lumen of *Acorus calamus* (sweet flag). The purified protein strongly inhibits hyphal growth of fusarium and other pathogens, suggesting a role in host defence.



Phytoliths and systematic associations from Pampa grassland flora

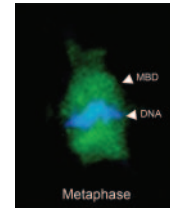
Phytoliths are soil micro-fossils made of hydrated SiO₂. **Honaine *et al.*** (pp. 1155–1165) use phytolith morphology to clarify family and subfamily differentiation in Asteraceae and Poaceae families from south-east Pampean Plains of Argentina and establish general patterns of phytolith–plant systematic relationships.



Elaborate petals in Australian *Spermacoce* (Rubiaceae) species

Australian representatives of the pantropical genus *Spermacoce* show

wide variation in the morphology of their elaborate petals. **Vaes *et al.*** (pp. 1167–1178) assess floral morphology and development in six species with elaborate petals and identify two morphological lineages, each implementing a different pollination strategy.



Functions of methyl DNA-binding protein during cell division

5-Methylcytosine (m⁵C) is essential for epigenetic regulation of gene expression by interacting with MBD proteins. **Yano *et al.*** (pp. 1179–1187) demonstrate that arabidopsis MBD5 binds specifically to a small GTPase during cell division, thereby influencing chromatin structures by binding to m⁵C, and later in mitosis, by detaching from m⁵C.



Pseudoviviparous reproduction in two sympatric species of *Leiothrix*

Coelho *et al.* (pp. 1189–1195) examine the origin and maintenance of pseudovivipary in two *Leiothrix* species. They show a diversification in pseudoviviparous reproduction. *Leiothrix spiralis* exists as a splitter ramet, while *L. vivipara* exhibits a pseudoviviparous canopy-forming strategy. The advantages of each strategy are discussed.



Overcoming seed germination problems in a Japanese orchid

Cephalanthera falcata is an endangered orchid for which successful propagation from seed appeared impossible.

Yamazaki and Miyoshi (pp. 1197–1206) overcome the problem by using immature seeds. Histological observations suggest that lignin accumulation in the inner integument surrounding the embryo during seed maturation may be responsible for the troublesome dormancy.



Genetic structure in the orchid *Oncidium hookeri*

Genetic variation in six populations of *Oncidium hookeri* from the Brazilian Atlantic rainforest is characterized by **Alcantara et al. (pp. 1207–1213)** using allozyme electrophoresis. Despite heterozygote deficiencies probably caused by pollinator behaviour, little differentiation among populations is revealed. This may be a result of long-distance wind-dispersal of seeds.



Convergence confounds taxonomic classification based on orchid flower morphology

Davies and Stpiczynska (pp. 1215–1231) compare labellar micromorphology of *Bifrenaria*,

Rudolfiella, *Teuscheria* and *Xylobium* (Bifrenariinae) with that of *Maxillaria* and *Mormolyca* (Maxillariinae *sensu stricto*). Although *Xylobium* and *Teuscheria* share labellar moniliform hairs and secretory papillae with *Maxillaria sensu stricto*, this does not necessarily reflect taxonomic relationships but may be attributed to a convergence response to similar pollinator pressures.



Timing of seedling emergence determines success in *Pinus sylvestris*

Field experiments in Spain by **Castro (pp. 1233–1240)** show that environmental conditions such as drought that delay germination of scots pine, even by only a few days, depress establishment success. Tests across the geographical range of *P. sylvestris* validate the findings for different environments.



Diversity and origin of 'weedy rice' in north-eastern China

Weedy rice is a widespread problem in arable farming. **Cao et al. (pp. 1241–1252)** analyse variation in weedy rice populations from northeastern China using microsatellite markers. The populations appear to originate from locally cultivated rice after mutation and intervarietal hybridization. Recent changes in farming practices have promoted their emergence and diversity.



Floral scent diversity in *Petunia axillaris*

Petunia axillaris is a parental species of the garden petunia. Among its subspecies are various lines emitting different scents.

Kondo et al. (pp. 1253–1259) analyse emitted and endogenous components of floral scent and reveal that floral scent diversity results from variation in both endogenous production and evaporation rate of the individual volatile compounds.



α -Pinene induces oxidative damage in roots

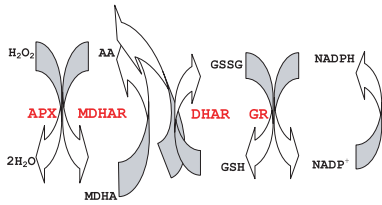
α -Pinene, a major monoterpene component of volatiles released by a wide range of species, is a potent phytotoxin. **Singh et al. (pp. 1261–1269)** report that α -pinene inhibits root growth by causing oxidative stress through enhanced generation of reactive oxygen species, and upregulates antioxidant enzymes as a secondary defence mechanism.



Root-to-shoot signalling helps sense location of P-rich soil

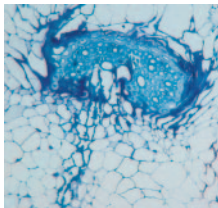
Root plasticity plays a key role in foraging for minerals in heterogeneous soil. **Kume et al. (pp. 1271–1277)** observe that adventitious nodal roots of maize elongate preferentially into P-enriched soil as if the stem-base

perceives the position of P-rich parts, suggesting a response to a signal from the roots.



Glutathione reductase (GR) gene expression and water stress

GR can help remove any potentially damaging reactive oxygen species produced in response to water deficit. Contour-Ansel *et al.* (pp. 1279–1287) compare gene expression of cytosolic and dual-targeted GR in two cowpea cultivars of contrasting drought tolerance. Differences in transcript level under drought, desiccation and ABA treatment are closely related to susceptibility to soil drying.



Variable success of hemi-parasitic *Rhinanthus minor* explained

Grasses, forbs and legumes vary in their quality as hosts for *Rhinanthus minor*. Grasses are preferred.

Cameron *et al.* (pp. 1289–1299)

show that host quality is governed by resistance capacity. Only forbs possess successful resistance mechanisms. The impact of this differential resistance on plant communities containing *R. minor* is discussed.



Aquaporin regulation in bean plants

Effects of drought, abscisic acid and transpiration rate on aquaporin regulation are examined by Aroca *et al.* (pp. 1301–1310). Aquaporin expression in leaves appears to be regulated by transpiration rate and, in roots, by soil water potential. In plants treated with abscisic acid, a correlation exists between PIP1 aquaporin abundance and root hydraulic conductance.



Ultrastructure of embryo development in *Paphiopedilum delenatii*

A detailed ultrastructural study of embryo, suspensor and integument

during seed development in *P. delenatii* by Lee *et al.* (pp. 1311–1319) reveals vacuolated suspensor cells with transfer cell features and the suspensor cell walls without cuticles. These findings support the view that the suspensor is the major site for nutrient uptake.



Salinity influences hydraulic architecture in mangrove

A study by Schmitz *et al.* (pp. 1321–1330) of the hydraulic architecture of *Rhizophora mucronata* along an ecological gradient shows that vessel density is closely related to salinity, thus supporting its use as an environmental proxy. In contrast, vessel diameter is much less affected. The functional significance of the observations for water transport is discussed.